A Golden Age for M&V Protocols! A Confusing time for M&V Practitioners?

Lawrence Berkeley National Lab

March 2nd, 2012

Steve Kromer P.E., CMVP

One Career, One Perspective

- M&V for hire
  - LBL - FEMP Program 1993-1999
  - Enron Energy Services – 2000 – Bk.
  - M&V Consulting (2003- 2010)
  - CPUC Consultant (2005-2012)
- Volunteer Activities
  - EVO Chairman (2003-7), Currently Treasurer
  - Chairman CMVP Board of AEE (Association of Energy Engineers)

Perspective - EVO

EVO's mission is to develop and promote the use of standardized protocols, methods and tools to quantify and manage the performance risks and benefits associated with end-use energy efficiency, renewable energy, and water efficiency business transactions.

-Founded as IPMVP Inc. in 2001

-Responsible to “clients” , customers and community

-~2000 Certified M&V Professionals (CMVPs)

-Software companies

-Consultants

What exactly IS the IPMVP?

- "Just the scientific method – reformulated"
- "Guideline"
- "Textbook Methodology", not a standard
  - Generic, by design
  - Flexible
  - Perhaps too academic
  - Perhaps not adapting quickly enough for new demands/markets

LAWRENCE BERKELEY LABORATORY
WASHINGTON, DC OFFICE
TEL: (202) 484-0880
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FAX MEMORANDUM

TO: Jeff Harris / Steve Wiel - LBL DC

FROM: Moira Howard

DATE: August 12, 1994

RE: **ESTABLISHING NATIONAL MONITORING AND VERIFICATION PROTOCOLS FOR COMMERCIAL AND PUBLIC BUILDINGS**

TOTAL PAGES SENT: 2

WORKSHOP Organized by:

Jeff Genzer (NASEO)	tel. 202 467-6370
Greg Kats (DOE)	tel. 202 586-1392
Steve Kromer (DOE)	tel. 202 484-0885
Art Rosenfeld (DOE)	tel. 202 586-6593

DATE: Friday, Sept 16, 1994 — 12 to 5
Lunch served if you RSVP!

LOCATION: LBL Washington Office:
1250 Maryland Ave. SW
Suite 150
R.S.V.P. to: Moira Howard, — tel. 202 484-0881
fax. -0888

A number of us at DOE, NASEO and other institutions are seeking to accelerate the retrofit of public buildings. The establishment of voluntary consensus national monitoring and verification protocols can potentially contribute to this effort. This would increase confidence within the financial community and improve performance of the retrofits.

To this end we are inviting you to participate in a Friday, September 16, 1994 workshop for 15 to 20 experts to discuss existing protocols and the upcoming ASHRAE guideline (14-P), and how we can build on these to establish national protocols. We will not be seeking to develop technical details. Instead, the intent of this workshop is to build consensus on a framework.

If you are coming to the ACE3 Asilomar conference, Greg, Steve and Art will host an informal session on this issue, on Monday, Aug 29th, from 4 to 6 pm. Please join us.

Most Recent Golden Era for M&V

- Early 1990s
  - ASHRAE 14 -1993
  - EPA / CVP -ask Alan Meier
  - NAESCO – Early 1990's
  - FEMP M&V Protocols- 1994
  - IPMVP - 1996

Original Disparity in Defining "Savings"

- The Perspective Matters
- The Context Matters

- ASHRAE – looking for precise, scientific, answer
  - Think of ATMs that resolves exactly
- IPMVP – Transaction based, legal basis between parties in a contract
  - Think of bargaining in a Shanghai marketplace

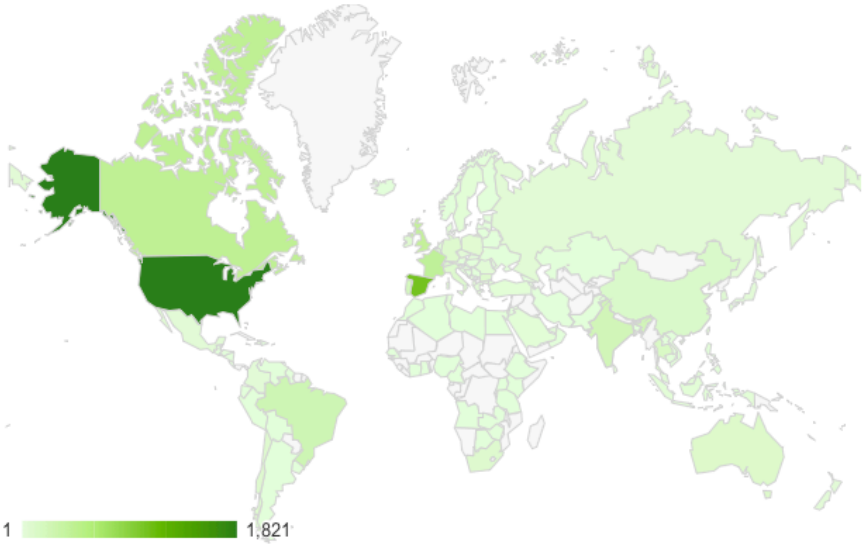
- Neither ASHRAE nor IPMVP was designed for Evaluation studies

What drives disparity?

- M&V Issue #1 - cost
  - One can assume that, with enough Time and Money, anyone could produce a reproducible result
  - Infinite Time and Money are not available for M&V.
- M&V Issue #2 – Risk/ Responsibility
  - Who created the "savings"?

M&V Circa 2012

- IPMVP –
  - 2000 Certified (CMVPs)
  - 6000 Web site visits / month from 100+ countries
  - Global recognition and community
  - Referenced in almost all Evaluation M&V guides
- IPMVP a framework, with examples



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6,792	**3.20**	**00:03:24**	**62.78%**	**47.60%**
% of Total: **100.00%** (6,792)	Site Avg: **3.20** (0.00%)	Site Avg: **00:03:24** (0.00%)	Site Avg: **62.78%** (0.00%)	Site Avg: **47.60%** (0.00%)

Primary Dimension: **Country/Territory** City Continent Sub Continent Region

Secondary dimension ▾ advanced

	Country/Territory	Visits ↓	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
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3.	Canada	**443**	3.39	00:03:30	59.82%	43.57%
4.	France	**408**	3.63	00:03:28	66.67%	42.40%
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8.	Portugal	**196**	3.79	00:02:49	55.10%	41.84%
9.	Thailand	**122**	5.64	00:08:43	29.51%	40.16%
10.	China	**101**	3.43	00:05:26	70.30%	44.55%

What's the best thing about standards?

There are so many to choose from!

- Global – ISO
  - Energy Management (50001) TC 242
  - Energy Savings TC 257
- US
  - NAESB - North American Energy Stds Board
  - Department of Energy
    - SEP
    - C-SEP (SEP-CB?)
    - Uniform Methods Project
    - SEE Action
    - NEEP
    - NW RTF
    - …

Why This Matters

- 2012 is a boom time for M&V protocols and standards
- Evaluation and M&V are under scrutiny
- There are many efforts to "fix" Evaluation and M&V
- M&V is still an art and a profession
- Professional communities need ways to communicate

Categories of Protocols

- Driven by Commerce
  - IPMVP, ASHRAE
- Driven by Programs
  - SEP, C-SEP, LEED, FEMP, USGBC, UNFCCC - CDM
- Driven by Congress
  - UMP
  - SEE Action
- Driven by Other Politics
  - ISO
  - CARB, Cal-ISO

Programs Perspectives

- SEP, ISO 50001, ISO TC 242 and 257
  - Energy Management
- Evaluation (Program Effectiveness)
  - UMP – Nationwide EE accounting methods
- Regional / Grid – Planning and Operations
  - NAESB
  - CARB/ Cal-ISO – big picture…

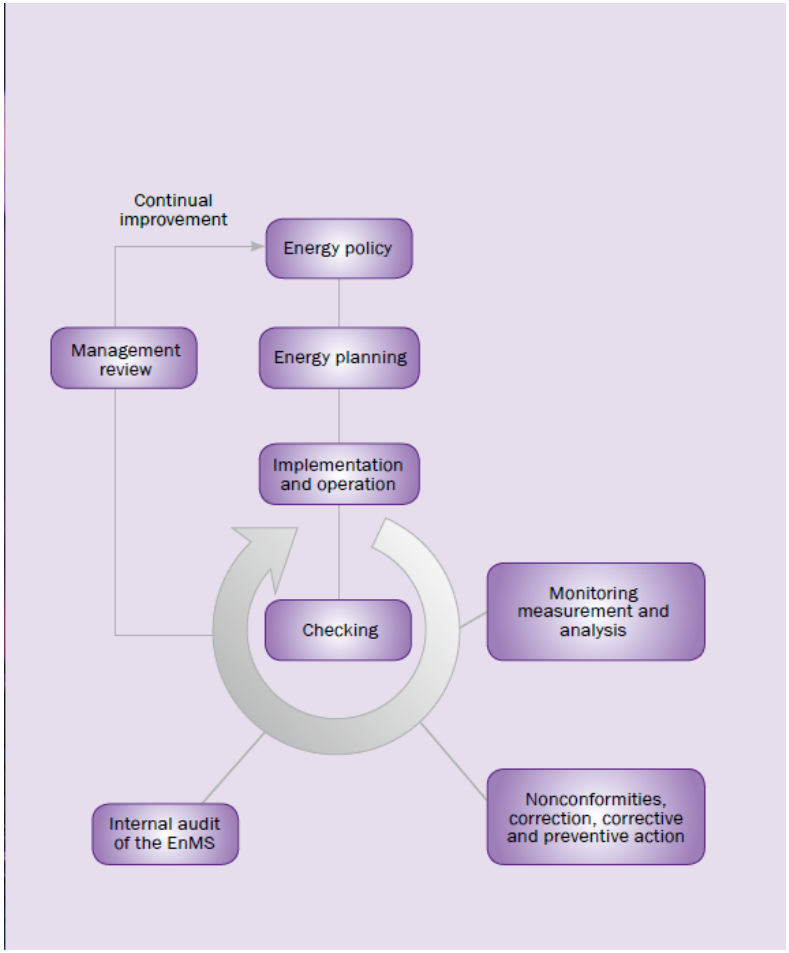
Energy Management

- Getting management to account for EE
- ISO 50001 – Energy Management Standard
- ISO TC 242 – Support committee to 50001
- ISO TC 257 – New TC for Energy Savings
- SEP – US DOE Superior Energy Performance
- GSEP, C-SEP – Global and Commercial SEPs

ISO 242 and 257 and JPC 2

- International Standards Organization (ISO)
- Member Nations + liaison Organizations

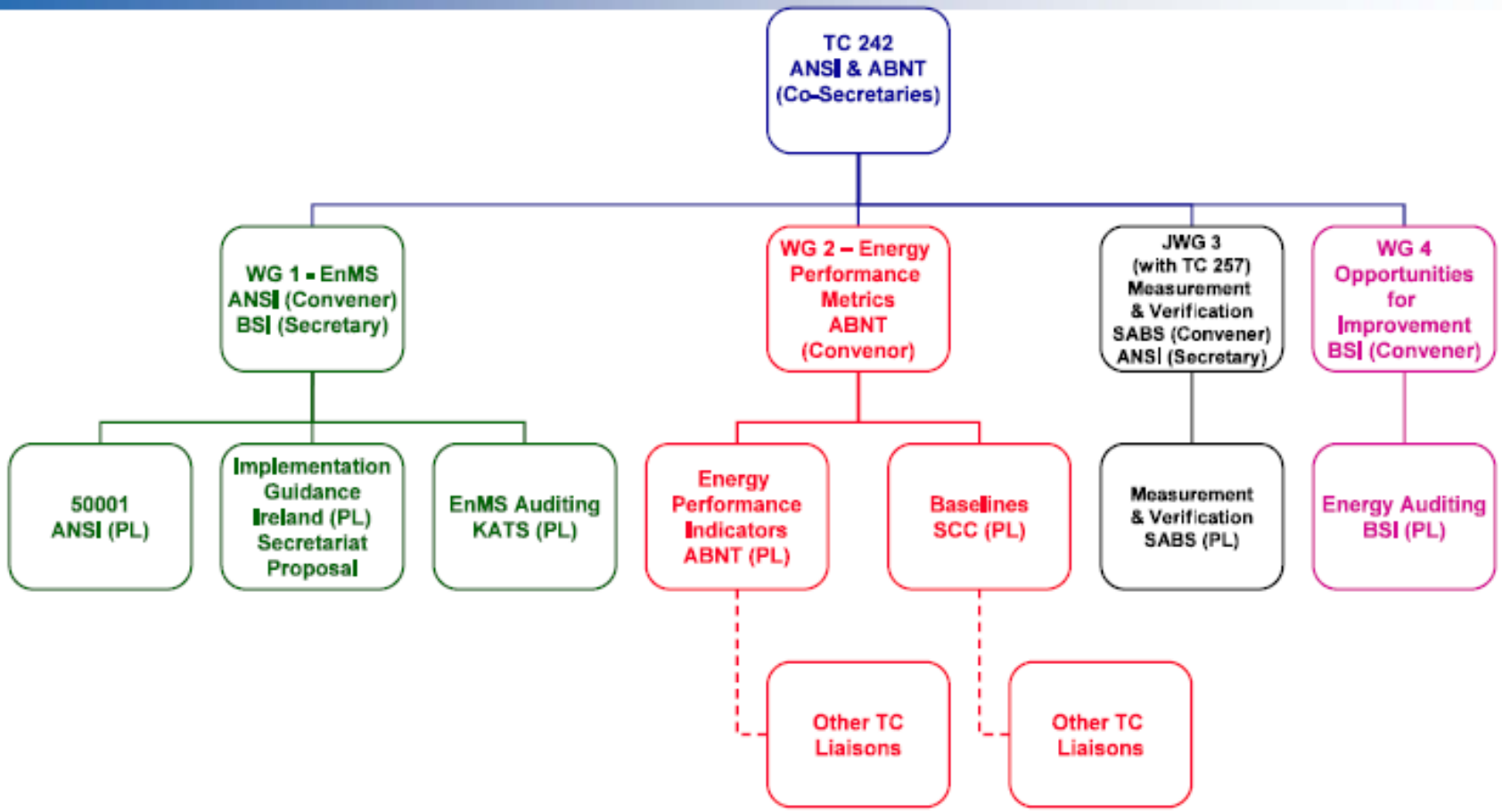
ISO 50001 – A New Era



ISO TC 242

- Started in May, 2008
  - US/Brazil
- **Scope** Standardization in the field of energy management, including energy use and consumption, energy management, energy supply, procurement practices, measurement and verification, energy savings calculations, energy auditing/ assessments, sector specific guidance, competence of energy management professionals and certification bodies, development and tracking of energy performance indicators, energy as it relates to sustainability , and other topics.
- i) Measurement and verification of energy performance improvements compatible with internationally acceptable practices, including connections to greenhouse gases,

ISO/TC 242 ENERGY MANAGEMENT POSSIBLE TC/WG STRUCTURE



ISO TC 257

- Started in June 2011-
  - China/France Co-Secretary
- WG 01 Definition of a methodological framework applicable to calculation and reporting on energy savings
- WG 02 General calculation methods on energy efficiency and savings for countries, regions or cities
- WG 03 General technical rules for measurement, calculation and verification of energy savings of projects
- ISO/TC 242 – ISO/TC 257 JWG 03 Measurement & verification of organizational energy performance - General principles and guidelines
- EVO is listed as Coordinator on W.G. 3

Superior Energy Performance -SEP

Global SEP (GSEP)

Global Superior Energy Performance Partnership (GSEP)

Energy Management Working Group

The Global Superior Energy Performance Partnership (GSEP) Energy Management Working Group will facilitate an international dialogue to share strategies and best practices to foster and accelerate energy management and continuous energy performance improvements in industrial facilities and buildings. It has three main strategic objectives:

- Increase the implementation of energy management in the industrial and buildings sectors in order to improve energy efficiency and energy performance on an ongoing basis
- Measure and verify energy performance improvements on a consistent basis
- Build a qualified workforce of professionals with expertise in the fields of energy management, energy efficiency, and measurement and verification

Working Groups:

- Energy Management
- Power
- Steel
- Cool Roofs
- CHP
- Cement

- Measurement and Verification (M&V) Task Force
  - Share information related to developing M&V protocols and compile best practices and inventory resources
  - Design a standardized M&V protocol to be used across GSEP Energy Management Working Group countries
  - Develop a voluntary reporting mechanism to share data needed to benchmark facility performance
- Qualified Workforce Task Force
  - Share information related to credentialing programs, including qualification criteria, training requirements, and training materials
  - Create standardized credentialing processes, including establishing uniform qualification criteria and moving toward greater harmonization of training programs across GSEP Energy Management Working Group countries

Programs Perspectives

- SEP, ISO 50001, ISO TC 242 and 257
  - Energy Management
- Evaluation (Program Effectiveness)
  - UMP – Nationwide EE accounting methods
  - SEE Action, NEEP, NW RTF
- Regional / Grid – Planning and Operations
  - NAESB
  - CARB/ Cal-ISO – big picture…

Evaluation vs "M&V"

- Evaluation
- Program Evaluation
- M&V
- Build your own glossary….

EXAMPLE: California

2006-2008 Energy Efficiency Programs

Investment

$2.0+ Billion

2006 EM&V Protocols
Based on:
IPMVP

- T -8, CFL Lighting
- Chillers
- Boilers
- Plant Improvements
- High Efficiency Motors

Supply-Side

Generation
Transmission
Distribution

Demand-Side

Efficiency
Demand Response

SEE Action

STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

Scope

- While EM&V is most frequently associated with ratepayer-funded programs, SEE Action includes energy efficiency EM&V regardless of funding source
- This blueprint addresses both market needs and specific actions the SEE Action network can take to address those needs
- While SEE Action addresses all markets, the current focus of the EM&V working group is residential, commercial, and industrial programs administered by:
  - Utilities
  - Third-party program administrators
  - Local and state government entities
  - Private and public entities (for their own facilities)
- Focus on:
  - High-level capacity building and tools, best practices dissemination, both resource development and leveraging existing resources and infrastructure
  - Largely resource acquisition rather than market transformation
  - Uniformity of EM&V definitions and comparability of reported EM&V results (e.g., energy and demand savings)

www.seeaction.energy.gov

SEE Action

STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

Key Solutions & Actions to Achieve the Goal

GOAL: Transform EM&V to yield more accurate, credible, and timely results that accelerate successful energy efficiency deployment and management

Develop a foundation for improving credibility and cross-jurisdiction comparability

1. Consistent savings estimates and consistent and comparable reporting
Resource for calculations, uniform definitions and common forms

2. Review and update EM&V resource guides
Impact evaluation techniques explained

3. Uniform methods and/or standards
Set of voluntary methods/protocols

Explore new methods to address emerging issues and technologies

4. Explore new technology solutions
Use Smart Grid and AMI to measure and verify savings

5. Innovative analysis techniques
New methods provide more efficient EM&V and maintain rigor

Build capacity and increase adoption of best practices

6. Resource accessibility and tool development
National or regional databases of reports, plans, and stipulated savings values

7. Training
Increase the number of EM&V practitioners and their level of expertise and experience

*EM&V is different from the other SEE Action working groups; it does not focus on a sector or one issue. Hence, each of the solution pathways are highly interconnected.

SEE Action

STATE ENERGY EFFICIENCY ACTION NETWORK

www.seeaction.energy.gov

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

NREL HOME

Uniform Methods Project

Uniform Methods Project Home

About the Uniform Methods Project

Draft Protocols

Project Members

Meetings

Related Links

Contacts

Printable Version

Draft Protocols

Through the Uniform Methods Project, the Energy Department and NREL aim to publish a document for evaluating, measuring, and verifying savings for seven energy efficiency measures in Fiscal Year 2012. As the draft protocols are developed, links will be added to the list below.

- Residential Lighting (deadline: **Friday, February 10, 2012**)
- Commercial Lighting
- HVAC, Unitary Commercial (deadline: **Friday, February 17, 2012**)
- HVAC, Residential Boilers and Furnaces
- Refrigerator Recycling (deadline: **Friday, February 17, 2012**)
- Whole-House Retrofit
- Lighting Controls

It is an expectation of the steering committee that they will support the development and adoption of the methods. If submitting general comments, steering committee members should use the draft protocols commenting tool to submit their review of each of the protocols. Or, if members are planning to conduct a more in-depth review, they may track their changes directly into the Word document and email the edits to chuck.kurnik@nrel.gov. Thank you so much in advance for your participation in this process.

Printable Version

NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS
FACILITATING PARTNERSHIPS TO ADVANCE ENERGY EFFICIENCY

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EM&V Forum » Project Committees & Subcommittees » Protocol Development Projects

PROTOCOL DEVELOPMENT PROJECTS

The purpose of the protocol development projects is to move the region towards greater consistency in the methods and assumptions used to calculate energy efficiency savings impacts, and the reporting of energy efficiency savings, costs and emission impacts. The Protocol Development Committee is lead by co-chairs that each serve a one-year term.

View a summary of the Forum's 2009 projects, 2010 projects, 2011 projects, 2012 projects, and the Forum's Project Schedule.

ABOUT THE EM&V FORUM

FORUM PRODUCTS & GUIDELINES

STEERING COMMITTEE

PROJECT COMMITTEES & SUBCOMMITTEES

- Quarterly Project Committees Meetings
- **Protocol Development Projects**
- Research & Evaluation Projects
- Education & Information Access

MEETINGS & EVENTS

EM&V FORUM LIBRARY

Glossary of Terms and Acronyms

The Glossary provides a common base of understanding of terms pertaining to electric and gas efficiency evaluation, along with related terms used by air regulators and common acronyms. It is the first step in building common EM&V protocols and in increasing awareness of the benefits of establishing protocols. The Version 1 Glossary was completed in 2009. Version 2 added about 60 terms that were not included in Version 1, and was completed in March 2011. Version 2.1 includes several additional environmental terms, and was adopted by the Steering Committee in July 2011 . For more information, see the Project Summary.

- View a list of subcommittee members.
- View the Glossary Version 2.1
- Forum Participants can log in here to view project materials and subcommittee meeting notes.

Common EM&V Methods and Savings Assumptions Guidelines

This project developed EM&V methods guidelines for calculating electric and gas energy efficiency savings across the region and surveyed savings assumptions for priority measures to identify where greater consistency is needed or where differences are warranted due to variations in programs. For more information, see the Project Summary.

- View a list of subcommittee members.
- View the Regional EM&V Methods and Savings Assumptions Guidelines
- Forum Participants can log in here to view project materials and subcommittee meeting notes.
- View this project's RFP.

Pacific Northwest Deemed Measure Review and Standardized Measurement and Verification Protocols Projects

The RTF issued two requests for proposals for a deemed measure review project and a standardized measurement and verification (M&V) protocols project. The RTF selected SBW Consulting as the contractor for both projects and subsequently merged two subcommittees into one to provide oversight for both projects.

Deemed Measure - The purpose of this work is to strengthen technical analyses and input assumptions used for deemed energy efficiency measures by the RTF and recommend the addition or removal of deemed measures by the RTF. Work and work products under this contract will involve a review and comparison of deemed electrical energy savings used throughout the Northwest region with those used nationally. SBW will provide a detailed review of the energy savings calculation methodologies and input assumptions if the comparison of regional and national methodologies and assumptions reveals significant differences or if the RTF has omitted a measure or if the measure is considered a priority.

Standardized M&V - The purpose of this project is to develop a suite of measure-specific, simplified M&V protocols approved by the RTF for use in Pacific Northwest electric energy efficiency programs. By providing simplified M&V protocols, the RTF intends to help reduce the barriers commonly associated with development and implementation of custom M&V plans. SBW will perform a review of M&V protocols and calculators used in energy efficiency programs throughout the Region and the country, make recommendations for streamlining measurement implementation, and begin creating a suite of RTF-approved simplified M&V protocols.

Programs Perspectives

- SEP, ISO 50001, …
  - Energy Management
- Evaluation (Program Effectiveness)
  - UMP – Nationwide EE accounting methods
  - SEE Action, NEEP, NW RTF
- Regional / Grid – Planning and Operations
  - NAESB
  - CARB/ Cal-ISO – big picture…

NAESB

- North American Energy Standards Board
- Model Business Practices
- Wholesale / Retail
- Independent Service Operators (ISO)
  - Rules for integrating EE into Forward Capacity Markets
- References IPMVP Options

NAESB

- **Subcommittee Establishment Work Paper Draft**
- **NAESB Model Business Practices for the Measurement and Verification Energy Efficiency in Wholesale and Retail Markets**
- **June 24, 2009**
  Eric Winker, ISO-New England, Neal H. Allen, Southern Company, Co-Chairs

- A Standard for measurement and verification of energy efficiency has the potential to broaden implementation and acceptance of energy reduction measures and practices. In order to accomplish this, the standards need to factor differences in goals, while incorporating a level of specificity that will result in consistent and defensible results. The scope of the development process must at an early stage define the areas into which definition and specificity will be established.

E. U. Directives

- TBD

China

Newsroom

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"General Technical Rules for Measurement and Verification of Energy Savings" National Standard Passes Examination

[2011-12-14]

The national standard "General technical rules for measurement and verification of energy savings", drafted by the China National Institute of Standardization (CNIS) and other units under the jurisdiction of the National Standardization Technical Committee 20 on Energy Fundamentals and Management (SAC/TC20), passed examination on December 9, 2012.

- EV
- Ac ers
  - SGS
- CNIS, SAC, NDRC,

China

- EVO China Chapter
  - Active CMVP Schedule in 2012
  - 2 Main Training Partners
    - SGS
    - CIEE (Center for Industrial Energy Efficiency)

South Africa

- South Africa
  - Model for “developed” M&V community
  - National Standard (SABS) based on IPMVP

Others….

- UN – CDM?
- GSA Net Zero ESCO Challenge
- LEED
- Carbon, Cap and Trade
- ???

Common Issues

- Combining Top Down/ Bottom Up Concepts
- Wholesale /Retail Markets
  - California "Total Gross Market"
- Baselines
  - Context of market
- New M&V "Option" for Smart Meters?

Top Down / Bottom Up

- ISO 50001 - TC 242
- TC 257 – WG 2
- EU -
- California “Total Gross Market”

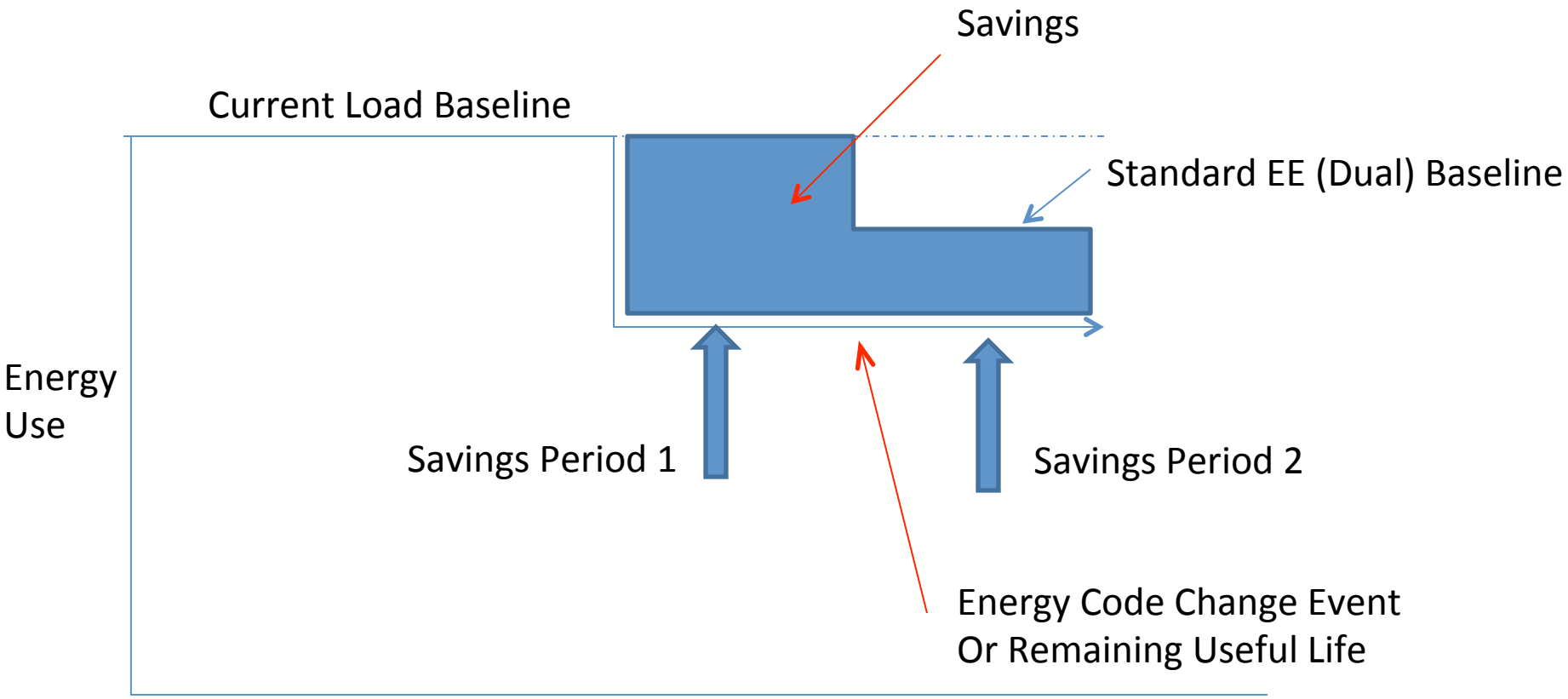
Baselines

- **REQ.19.3.2 Energy Efficiency Baseline Conditions**
- **REQ.19.3.2.1 Underlying Assumptions:** Baseline definitions should include a description of underlying assumptions used for establishing the Baseline conditions that would have occurred in the absence of the program (i.e., the counterfactual).
- **REQ.19.3.2.2 Energy Efficiency Baseline Conditions:** The baseline used by the retail Entity should reflect the conditions under which new Energy Efficient equipment or processes are installed to provide a service function. The four primary conditions are as follows:
- (a) Replacement of functional equipment still within its current useful life.
- (b) Replacement of functional equipment beyond its current useful life.
- (c) Unplanned replacement for (of) failed equipment.
- (d) New construction.
- **REQ.19.3.2.3 Standard Energy Efficiency Baseline:** The standard Energy Efficiency Baseline used by the EEP should be the nameplate rating of the equipment meeting the more stringent level of efficiency required by applicable state code, the federal or state (as applicable) product efficiency standard, or standard practice. The standard Energy Efficiency Baseline should be determined at the time of installation or as set forth in the Governing Documents or as established by the Applicable Regulatory Authority. A baseline that varies over the measure's life may be used, for example if the expected remaining life of the existing equipment is less than the measure life.
- **REQ.19.3.2.4 Current Load Energy Efficiency Baseline.** The current load Energy Efficiency Baseline used by the EEP should be the current load of the existing operating equipment. The current load Energy Efficiency Baseline should be determined at the time of installation or as set forth in the Governing Documents or as established by the Applicable Regulatory Authority.

Baselines

	Primary Condition	Standard EE Baseline	Current Load EE Baseline
A	Replacement of Functional Equipment within its Current Useful Life		X
B	Replacement of functional equipment beyond its current useful life	Depends on Governing Documents or Applicable Regulatory Authority	Depends on Governing Documents or Applicable Regulatory Authority
C	Unplanned replacement for (of) failed equipment	X	
D	New construction	X	

Dual Baselines



M&V Protocols Wrap Up

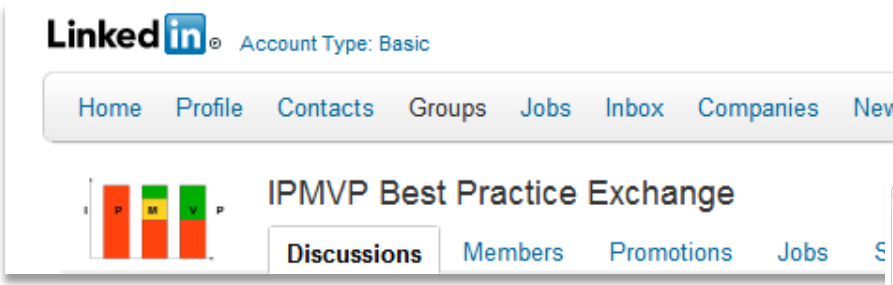
- Many contexts
- Much good work to draw from
- Many activities

- Need for coordination? Who will do it?

Beyond Protocols

- Workforce / Certification

- Communication / Community



2012 Training Events

Upcoming

February 28-March 1, Valencia, Spain (Es)
March 5-7, Beijing, China (Cn)
March 7-9, Paris, France (Fr)
March 7-9, Shanghai, China (Cn)
March 12-14, Moscow, Russia (Rs)
March 19-21, Lisbon, Portugal (Pt)
March 21-23, Taipei, Taiwan (Cn)
March 28-30, Shenzhen, China (Cn)
April 11-13, Beijing, China (Cn)
April 17-19, Guatematela City, Guatemala (Es)
April 19-21, New Delhi, India (En)
April 24-26, Guangzhou, China (Cn)
April 25-27, London, UK (En)
May 2-4, Geneva, Switzerland (Fr)
May 16-18, Paris, France (Fr)
July 4-6, Chongqing, China (Cn)
July 24-26, Beijing, China (Cn)
August 15-17, Schenzhen, China (Cn)
September 12-14, Shanghai, China (Cn)
October 3-5, Geneva, Switzerland (Fr)
October 24-26, Beijing, China (Cn)
December 5-7, Beijing, China (Cn)

Upcoming

March 5-7, Atlantic City, NJ, USA (En)
March 12-14, Johannesburg, South Africa (En)
May 21-23, Seattle, WA, USA (En)
May 23-25, Johannesburg, South Africa (En)
September 12-14, New York, NY, USA (En)
October 17-19, Johannesburg, South Africa (En)
October 29-31, Atlanta, GA, USA (En)
December 3-5, Anaheim, CA, USA (En)

Communication

- Newsletters
- Web sites
- Social Networks
- Local Partners

LinkedIn Account Type: Basic

Home Profile Contacts Groups Jobs Inbox Companies News More

IPMVP Best Practice Exchange

Discussions Members Promotions Jobs Search More...

Follow Cláudio

Cláudio Monteiro • I see M&V in three perspectives, or usage levels: M&V to control, M&V to verify and M&V to monitor.
The "M&V to verify" contractual savings have an intangible value and is an essential requirement. Simple, EPC between different parties will not happen without M&V, is like commercializing energy without energy meter.
The "M&V to control" have a tangible value because allow a dynamic (re)action that generate savings. Concepts of demand response and smart grid systems are always justified economically by benefits of similar control (re)actions.

Follow Sam

Sam Cooper • The levels of M&V depend on tolerable risk and associated costs. The "true" savings from an energy efficiency project or an ECM may never be assessed until one expends tremendous amount of effort and resources. M&V strategy involved tries to strike an optimal balance between the M&V effort (data gathering, analysis and reporting) and costs involved for these efforts. M&V does not save any energy or related costs, in addition adds costs to the project. Given that M&V costs money, the question arises as to how much M&V do ESPC projects really need? For that matter do we need M&V at all?

23 hours ago • Like

It all comes down to ….. Data

- Data Management
- Measure Databases
  - DEER
  - Internal Utility Databases
    - Customer Relationship Management (CRM)
    - Technical Databases – MDSS, MMDB, Portfolio Builder
- DOE Buildings Performance Database

Data - Integrating Results

- Engineering Standards
- Corporate/IT Customer data standards
  - NARUC Common Spec for EE Programs?
  - ERP/CRM Vendors?
- Sharing data
  - Open EMV (linked data)
- Financial data

Conclusion

- Protocols are great – everyone is writing one.
  - Tools to direct activity in a certain context
- To be most useful –
  - Widely applicable
  - Trainable/ Certifiable
  - Means of building community of practice
- Protocols are one leg of the stool (1/3)

  (2)Community and (3)Communication

A Golden Era for the M&V Community